

MATHEMATICS TEST

60 Minutes—60 Questions

DIRECTIONS: Solve each problem, choose the correct answer, and then fill in the corresponding oval on your answer document.

Do not linger over problems that take too much time. Solve as many as you can; then return to the others in the time you have left for this test.

You are permitted to use a calculator on this test. You may use your calculator for any problems you choose,

but some of the problems may best be done without using a calculator.

Note: Unless otherwise stated, all of the following should be assumed.

1. Illustrative figures are NOT necessarily drawn to scale.
2. Geometric figures lie in a plane.
3. The word *line* indicates a straight line.
4. The word *average* indicates arithmetic mean.

1. If $m = 4$, $n = -5$, and $p = 9$, what is the value of $mp - mn$?

A. 16
B. 31
C. 41
D. 56
E. 81

2. Vehicle A averages 19 miles per gallon of gasoline, and Vehicle B averages 37 miles per gallon of gasoline. At these rates, how many more gallons of gasoline does Vehicle A need than Vehicle B to make a 1,406-mile trip?

F. 28
G. 36
H. 38
J. 56
K. 74

3. If $\frac{z}{y} = \frac{1}{9}$ and $\frac{y}{z} = \frac{9}{8}$, then $\frac{z}{x} = ?$

A. $\frac{1}{648}$
B. $\frac{1}{8}$
C. $\frac{8}{81}$
D. $\frac{81}{8}$
E. 8

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DO YOUR FIGURING HERE.

4. If $12(x - 7) = -11$, then $x = ?$

F. $-\frac{95}{12}$
G. $-\frac{3}{2}$
H. $-\frac{11}{12}$
J. $-\frac{1}{3}$
K. $\frac{73}{12}$

5. The legs of a right triangle measure 18 m and 24 m, respectively. What is the length, in meters, of its hypotenuse?

A. 21
B. 30
C. 42
D. $\sqrt{252}$
E. $\sqrt{432}$

6. In the school cafeteria, students choose their lunch from 4 sandwiches, 2 soups, 2 salads, and 2 drinks. How many different lunches are possible for a student who chooses exactly 1 sandwich, 1 soup, 1 salad, and 1 drink?

F. 2
G. 4
H. 10
J. 16
K. 32

7. What is $\frac{1}{9}$ of 63% of \$6,000?

A. \$34,020
B. \$ 4,200
C. \$ 3,402
D. \$ 420
E. \$ 42

8. DMC Electronics Company builds 2 products: a DVD player and a VCR. Employees of the company can build a maximum of 150 DVD players per week and a maximum of 200 VCRs per week. No more than 450 products can be built per week. In the following inequalities, d represents the number of DVD players and v represents the number of VCRs. Which inequality expresses the constraint on the number of products built per week?

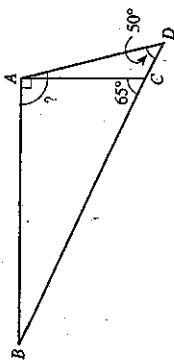
F. $d + v \leq 150$
G. $d + v \geq 200$
H. $d + v \leq 200$
J. $d + v \geq 250$
K. $d + v \leq 250$

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9. In the figure below, $\angle ADC$ measures 50° , $\angle ACB$ measures 65° , and $\angle BAC$ measures 90° . What is the measure of $\angle BAD$?



- A. 105°
B. 115°
C. 130°
D. 140°
E. 155°

10. Which of the following is equivalent to $(2x + 3)(x - 7)$?

- F. $2x^2 - 21$
G. $2x^2 - 11x - 21$
H. $2x^2 + 11x - 21$
J. $2x^2 + 17x - 21$
K. $2x^2 + 17x + 21$

11. A baker has $4\frac{2}{3}$ cups of sugar in her pantry. Each cake she bakes requires $\frac{1}{2}$ cup sugar. Which of the following is the largest number of whole cakes for which she has enough sugar in her pantry?

- 2 3 8 9 10
A B C D E

12. If $f(x) = 6x^2 + 4x - 11$, then $f(-5) =$?

- | | | | | |
|------|------|----|-----|-----|
| F. | G. | H. | J. | K. |
| -181 | -119 | 61 | 119 | 159 |

13. Which of the following expressions is equivalent to $-x^2 - x$?

- A. $-x(x+1)$
 B. $-x(x-1)$
 C. $-x(1-x)$
 D. $x(x+1)$
 E. $x(x-1)$

- 14.** The student body at Julian High School consists of sophomores, juniors, and seniors only. The ratio of sophomores to juniors to seniors on Julian High School's student council is 2:3:4. There are 15 juniors on the student council. How many students are on the entire student council?

- | | | | | |
|----|----|----|----|-----|
| F. | G. | H. | J. | K. |
| 21 | 24 | 45 | 60 | 135 |

15. The second term of an arithmetic sequence is -14 , and the third term is -34 . What is the first term?

(Note: In an arithmetic sequence, consecutive terms differ by the same amount.)

- A. $\frac{1}{14}$ B. 6 C. 14 D. 20 E. -20

16. Last year, Tom earned an annual salary of $\$S$ from which a total of $\$D$ was deducted for taxes and insurance. The balance was Tom's take-home pay. Tom's take-home pay represents what fraction of his annual salary?

- | | | | | |
|---------------|---------------|-----------------|-----------------|-----------------|
| $\frac{D}{S}$ | $\frac{S}{D}$ | $\frac{D-S}{D}$ | $\frac{D-S}{S}$ | $\frac{S-D}{S}$ |
| F. | G. | H. | J. | K. |

17. Mara is the timer for a road race. She is 200 feet from the starting gun. Using 1,120 feet per second for the speed of sound, which of the following is closest to how many seconds after the starting gun is fired that Mara will hear the starting gun?

- A. 0.1
B. 0.2
C. 0.6
D. 0.9
E. 1.3

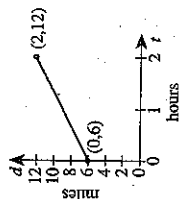
18. What is the slope of the line represented by the equation $6y - 18x = 6$?

F. 1
G. 3
H. 6
J. 18
K. -18

19. At a buffet restaurant, the price for dinner for an adult is \$6.95 and the price for dinner for a child is \$3.95. A group of 8 people went to the restaurant for dinner and paid a total of \$46.60, excluding tax and tip. How many adults were in the group?

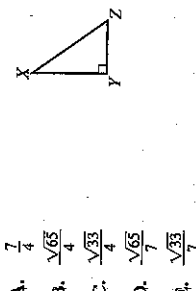
A. 2
B. 3
C. 4
D. 5
E. 6

20. The graph below shows the distance, d , miles, you are from home t hours following the start of a walk. Which of the following statements accurately describes your walk?



- F. You start at home, and after 2 hours are 12 miles from home.
G. You start at home, and after 2 hours are 6 miles from home.
H. You start 12 miles from home, and after 2 hours are home.
J. You start 12 miles from home, and after 2 hours are 6 miles from home.
K. You start 6 miles from home, and after 2 hours are 12 miles from home.

21. In right triangle $\triangle XYZ$ below, $\cos Z = \frac{4}{7}$. Which of the following expressions is equal to $\cos X$?



A. $\frac{7}{4}$
B. $\frac{\sqrt{65}}{4}$
C. $\frac{\sqrt{33}}{4}$
D. $\frac{\sqrt{65}}{7}$
E. $\frac{\sqrt{33}}{7}$

22. For any nonzero value of y , $(y^{-3})^2 = ?$

F. $\frac{1}{y^5}$
G. $\frac{1}{y^7}$
H. y^8
J. y^{15}
K. y^{125}

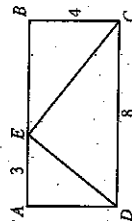
23. The ratio of the side lengths of 2 similar triangles is 3:5. The smaller triangle has sides that measure 5 centimeters, 7 centimeters, and 9 centimeters. What is the perimeter, in centimeters, of the larger triangle?

A. $12\frac{2}{3}$
B. 21
C. 35
D. 63
E. 105

24. Points $R(6,4)$ and $S(-4,5)$ lie in the standard (x,y) coordinate plane. What is the slope of \overline{RS} ?

F. $-\frac{1}{10}$
G. $\frac{1}{10}$
H. $-\frac{2}{9}$
J. $\frac{2}{9}$
K. $\frac{9}{2}$

25. In the figure below, E is a point on side \overline{AB} of rectangle $ABCD$. The measures given are in inches. What is the area of $\triangle DEC$, in square inches?



A. 10
B. 12
C. 16
D. 20
E. 32



DO YOUR FIGURING HERE.

Use the following information to answer questions 26–28.

Fran is planning to fence a 10-foot-by-15-foot rectangular plot of ground to use as a garden. She intends to plant a 1-foot-wide border of flowers along the inside of the entire perimeter. The rectangular section surrounded by this border will be planted with vegetables in 11-foot-long rows parallel to the longer sides.

26. What is the minimum number of feet of fence Fran would need to enclose the garden if there will be a 3-foot-wide opening on one side of the plot for people to walk through?

F. 22
G. 25
H. 47
J. 50
K. 150

27. What is the area, in square feet, of the rectangular plot?

A. 50
B. 104
C. 126
D. 146
E. 150

28. When Fran plants the vegetables, she wants the center lines of adjacent rows to be at least 10 inches apart. She also wants the center lines of the outermost rows to be at least 10 inches from the inner edge of the flower border. According to these planting restrictions, what is the maximum number of 11-foot-long rows of vegetables that could be planted within this garden plot?

F. 8
G. 9
H. 10
J. 11
K. 12

29. If $|x + 9| = 19$, what are the possible values for x ?

A. -28 and 10
B. -10 and 10
C. -10 and 28
D. -9 and 9
E. 10 and 28

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DO YOUR FIGURING HERE.

30. In the standard (x,y) coordinate plane, $M(9,-8)$ is the midpoint of \overline{TW} . If W has coordinates $(3,1)$, what are the coordinates of T ?

F. $(15, -7)$
G. $(15, -17)$
H. $(6, -\frac{7}{2})$
J. $(6, -9)$
K. $(6, -15)$

31. If the circumference of a circle is 96π centimeters, what is the radius of the circle, in centimeters?

A. $\sqrt{96}$
B. 24
C. 48
D. 96
E. 192

32. A rectangular tabletop is 14 inches wide and 48 inches long. Which of the following is closest to the length, in inches, of the diagonal of this tabletop?

F. 34
G. 50
H. 55
J. 62
K. 68

33. Rectangle $ABCD$ has vertices in the standard (x,y) coordinate plane at $A(-4,-2)$, $B(-4,3)$, $C(2,3)$, and $D(2,-2)$. A translation of rectangle $ABCD$ is a second rectangle, $A'B'C'D'$, with vertices $A'(4,-12)$, $B'(x,y)$, $C'(10,-7)$, and $D'(10,-12)$. What are the coordinates of B' ?

A. $(3, -6)$
B. $(4, 3)$
C. $(4, -7)$
D. $(4, -13)$
E. $(6, -5)$

34. The solution set for x of the equation $x^2 + nx - 8 = 0$ is $\{-2, 4\}$. What does n equal?

F. -8
G. -6
H. -2
J. 2
K. 6

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Use the following information to answer questions 35–37.

The Dow Jones Industrial Average (DJIA) is an index of stock values. The chart below gives the DJIA closing values from August 24 through September 30 of a certain year and the change in the closing value from the previous day. A minus sign indicates a *decline* (a closing value less than the previous day's closing value). A plus sign indicates an *advance* (a closing value greater than the previous day's closing value).

Dow Jones Industrial Average Closing Values

Date	Closing value	Change	Date	Closing value	Change
8/24	8,600	-85	9/13	7,945	+150
8/25	8,515	-85	9/14	8,020	+75
8/26	8,160	-355	9/15	8,090	+70
8/27	8,050	-110	9/16	7,870	-220
8/30	7,540	-510	9/17	7,895	+25
8/31	7,825	+285	9/20	7,930	+35
9/01	7,780	-45	9/21	7,900	-30
9/02	7,680	-100	9/22	8,150	+250
9/03	7,640	-40	9/23	8,000	-150
9/07	8,020	+380	9/24	8,025	+25
9/08	7,860	-160	9/27	8,110	+85
9/09	8,045	+185	9/28	8,080	-60
9/10	7,795	-250	9/29	7,845	-235
			9/30	7,630	-215

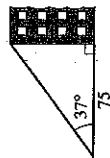
35. Which of the following is closest to the percent of decrease from the August 24 closing value to the September 30 closing value?
- A. 7.9%
B. 8.9%
C. 11.3%
D. 12.7%
E. 88.7%

36. The chart shows 4 more declines than advances. All of the following statements are true. Which one best explains why the decline from the August 24 closing value to the September 30 closing value was relatively large?
- F. The greatest change in the chart was a decline.
G. The least change in the chart was an advance.
H. The greatest number of consecutive declines was greater than the greatest number of consecutive advances.
J. The first change was a decline.
K. The average of the declines was much greater than the average of the advances.

DO YOUR FIGURING HERE.

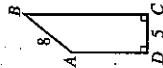
37. What is the average closing value for the 5-day period from September 13 through September 17?
- A. 7.895
B. 7.920
C. 7.964
D. 7.980
E. 8.090

38. The angle of elevation from a point on the ground to the top of a building is 37° , as shown below. The point is 75 feet away from the building. Which of the following is closest to the height, in feet, of the building?
- (Note: $\sin 37^\circ \approx 0.602$, $\cos 37^\circ \approx 0.799$, and $\tan 37^\circ \approx 0.754$)



- | | | | | |
|----|----|----|----|-----|
| 45 | 57 | 60 | 94 | 125 |
| E. | G. | H. | J. | K. |

39. For trapezoid $ABCD$ shown below, $AB = 8$ m, $DC = 5$ m, and the perimeter is 39 m. What is the area, in square meters, of $ABCD$?



- A. $32\frac{1}{2}$
B. 52
C. 65
D. 130
E. 260

40. The average distance from Earth to the Sun, which is 9.3×10^7 miles, is about how many times the average distance from Earth to the Moon, which is 2.4×10^5 miles?
- F. 4×10^2
G. 7×10^2
H. 4×10^{12}
J. 1×10^{13}
K. 2×10^{13}

41. Which of the following operations will produce the largest result when substituted for the blank in the expression $35 - \left(-\frac{1}{56}\right)$?

- A. Averaged with
B. Minus
C. Plus
D. Divided by
E. Multiplied by

42. A circle in the standard (x,y) coordinate plane has center $(7,-6)$ and radius 10 coordinate units. Which of the following is an equation of the circle?

- F. $(x+7)^2 - (y-6)^2 = 100$
 G. $(x+7)^2 - (y-6)^2 = 10$
 H. $(x+7)^2 + (y-6)^2 = 10$
 J. $(x-7)^2 + (y+6)^2 = 100$
 K. $(x-7)^2 + (y+6)^2 = 10$

43. In $\triangle XYZ$, $\overline{XY} \cong \overline{XZ}$ and the measure of $\angle Y$ is 22° . What is the measure of $\angle X$?

- A. 136°
B. 79°
C. 68°
D. 44°
E. 22°

44. What is the volume, in cubic centimeters, of a cube if the area of 1 square face is 144 square centimeters?

- | | |
|----|---------|
| F. | 36 |
| G. | 1,728 |
| H. | 20,736 |
| I. | 46,656 |
| K. | 373,248 |

45. If a number is chosen at random from the set $\{1, 2, 3, 4, \dots, 12\}$, what is the probability that the chosen number is a factor of 12?

- A. $1\frac{1}{3}$ B. $5\frac{5}{12}$ C. $1\frac{1}{2}$ D. $5\frac{5}{6}$ E. 1

46. Jamal invested \$1,000 on January 1. At the end of 9 months, during which time Jamal made no withdrawals and no other deposits, the investment has earned \$75 in interest. Jamal's \$1,000 investment returned an annual percentage yield closest to which of the following percents?

(Note: Interest can be estimated using $I = Prt$, where I is the amount of interest earned; P is the amount of money initially invested; r is the annual percentage yield that the money returned; and t is the time, in years, the money is invested.)

- | | | | | |
|-----|-----|-----|----|----|
| F. | G. | H. | J. | K. |
| 12% | 11% | 10% | 8% | 7% |

47. Consider the function $f(x) = 2x^2 + x$. What is the value of $f(f(3))$?

- | | |
|----|-----|
| A. | 75 |
| B. | 168 |
| C. | 465 |
| D. | 885 |
| E. | 903 |

448. What are the possible values of y such that $xy^2 = 54$, $x < 10$, $y < 10$, and x and y are integers?

- E. G. H. J. K.

